Publication Memo – Dr. Maria Konstantaki

My research centers on photonics and optical fiber sensing technologies for applications spanning structural health monitoring, environmental diagnostics, agrifood sustainability, and biomedical detection. I have authored and co-authored 44 peer-reviewed publications in leading international journals. My work combines fiber optics, engineering and materials science, to develop functional photonic systems that address real-world challenges.

A selection of key works from 2017 onward includes:

- **Applied Photonics Research in Collaboration with Industry.** Several of my research works have been conducted in close collaboration with industrial partners, addressing practical, company-defined challenges and involving real-world field testing and validation—notably,
  - the evaluation of drone agricultural spraying operations using optical fiber probes (*IEEE JSTQE, 2025*) in collaboration with IONOS, Heraklion, Crete
  - the monitoring of torque-induced strain in composite shafts for structural applications (*Sensors, 2021*) for the benefit of BT Composites, Florina, Greece,
  - the development of an optical fiber humidity sensor for assessing the wetting condition of oak barrels in wine production (*Biosensors, 2022; CLEO/Europe-EQEC, 2021*) in collaboration with the local cluster Wines of Crete, Heraklion, Crete.
- **Advanced Optical Fiber Sensors for VOC Detection and Biomonitoring.** I led the development of a compact, easily fabricated, optical fiber sensor capable of detecting volatile organic compounds (VOCs) at parts-per-billion levels, demonstrating applications in breath analysis (*IEEE Sensors Journal, 2025*)
- **Photonics for Agrifood and Environmental Sustainability**. I was invited to contribute a chapter to the 2025 Photonics for Agrifood Roadmap (*J. Phys. Photonics, 2025*), outlining the role of optical fiber sensors in sustainable agriculture, precision monitoring, and food safety.
- **Bioresorbable and Biocompatible Photonics**. My work on bioresorbable optical fiber Bragg gratings (*Opt. Lett., 2018*) established a foundation for temporary in vivo photonic probes, advancing the intersection of photonics and biomedicine. (*This publication was highlighted by OPTICA with a news release*).
- **Functional coatings and nanomaterials.** My research explores the use of thin films, nanostructures, and hybrid materials to enable the design of advanced optical fiber sensors for chemical and environmental monitoring — indicatively,
  - ZnO-overlaid Bragg gratings exploiting piezotronic and chemostrictive effects for VOC sensing (*IEEE Sens. J., 2023*).
  - silk fibroin films as responsive coatings for methanol vapor monitoring, demonstrating repeatability and long-term functionality after multiple exposures (*IEEE Photon. Technol. Lett., 2020*).

PUBLICATIONS IN PEER REVIEWED JOURNALS SINCE 2017

1. L. Smeesters, et al., *2025 photonics for agrifood roadmap: towards a sustainable and healthier planet*, J. Phys. Photonics 7 (2025) 032501. https://doi.org/10.1088/2515-7647/adbea9.

   Photonics innovations such as optical sensors and AI-driven imaging are transforming sustainable agriculture through precision monitoring of crops, soil, and food safety. The roadmap outlines current technologies, challenges, and trends shaping the future of agrifood photonics.

2. M. Konstantaki, E. Anthoulakis, S. Christodoulou, S. Pissadakis, *Assessment of Drone Agricultural Spraying Operations Using Optical Fiber Sensors*, IEEE Journal of Selected Topics in Quantum Electronics 31 (2025) 1–8. https://doi.org/10.1109/JSTQE.2025.3592264.

   A long-period grating optical fiber sensor monitors droplet dispersion during drone spraying, correlating spectral changes with droplet coverage. Field trials validate its effectiveness for tracking droplet delivery up to 22 m from the spraying path.

3. E. Grantzioti, S. Pissadakis, M. Konstantaki, *Optical Fiber Volatile Organic Compound Vapor Sensor with ppb Detectivity for Breath Biomonitoring*, IEEE Sensors Journal (2025) 1–1. https://doi.org/10.1109/JSEN.2025.3527765.

   A compact, low-cost optical fiber sensor detects volatile organic compounds at ppb levels, distinguishing methanol, ethanol, and isopropanol via spectral response. It demonstrates methanol detection down to 1 ppb, suitable for breath biomonitoring.

4. I. Chapalo, V. Sarakatsianos, E. Grantzioti, M. Konstantaki, G.D. Tsibidis, T. Manouras, M. Vamvakaki, S. Pissadakis, *Inscription of Bragg reflectors in polypropylene no-core optical fibers using 248 nm laser radiation*, Opt. Express, OE 32 (2024) 45554–45565. https://doi.org/10.1364/OE.539137.

   Bragg gratings were inscribed in polypropylene fibers using 248 nm laser light and toluene pre-loading, achieving threefold reflectivity increase. The gratings showed sensitivity to strain and temperature but not to water diffusion.

5. D. Lopez-Torres, C.E. Aguado, G.A. Pappas, M. Konstantaki, A. Klini, A. Lappas, F.J. Arregui, S. Pissadakis, Piezotronic, *ZnO Overlaid Bragg Grating Organic Vapor Sensors*, IEEE Sensors J. 23 (2023) 12536–12543. https://doi.org/10.1109/JSEN.2023.3270966.

   ZnO-coated fiber Bragg gratings detect alcohol and acetone vapors below 25 ppm at room temperature. The response stems from a piezotronic effect in ZnO, linking nanostructure deformation with optical shifts.

6. T. Chalyan, I. Magnus, M. Konstantaki, S. Pissadakis, Z. Diamantakis, H. Thienpont, H. Ottevaere, *Benchmarking Spectroscopic Techniques Combined with Machine Learning to Study Oak Barrels for Wine Ageing*, Biosensors 12 (2022) 227. https://doi.org/10.3390/bios12040227.

Spectroscopic methods combined with machine learning assess oak barrel aging by detecting aromatic compounds like lignin and tannin. Reflectance spectroscopy achieved >99% accuracy in classifying barrel usage levels.

7. M. Konstantaki, G. Violakis, G.A. Pappas, T. Geernaert, N. Korakas, N. Tiriakidis, T. Tiriakidi, K. Tiriakidis, H. Thienpont, F. Berghmans, J. Botsis, S. Pissadakis, *Monitoring of Torque Induced Strain in Composite Shafts with Embedded and Surface-Mounted Optical Fiber Bragg Gratings*, Sensors 21 (2021) 2403. https://doi.org/10.3390/s21072403.

   Embedded and surface-mounted fiber Bragg gratings monitor torque-induced strain in CFRP shafts. Sensors aligned with reinforcing fibers provide high sensitivity and reliable structural load measurements.

8. M. Konstantaki, D. Skiani, D. Vurro, A. Cucinotta, S. Selleri, A. Secchi, S. Iannotta, S. Pissadakis, *Silk Fibroin Enabled Optical Fiber Methanol Vapor Sensor*, IEEE Photon. Technol. Lett. 32 (2020) 514–517. https://doi.org/10.1109/LPT.2020.2982451.

   A silk-coated long-period grating detects methanol vapors via wavelength shifts up to 4 nm at 100 mbar. The sensor exhibits repeatability and long-term functionality after multiple exposures.

9. D. Pugliese, M. Konstantaki, I. Konidakis, E. Ceci-Ginistrelli, N.G. Boetti, D. Milanese, S. Pissadakis, *Bioresorbable optical fiber Bragg gratings*, Opt. Lett. 43 (2018) 671. https://doi.org/10.1364/OL.43.000671.

   Bragg gratings inscribed in calcium-phosphate glass fibers dissolve in physiological conditions, enabling temporary, biocompatible sensors for in vivo chemical and mechanical monitoring.

10. R. Gassino, Y. Liu, M. Konstantaki, A. Vallan, S. Pissadakis, G. Perrone, *A Fiber Optic Probe for Tumor Laser Ablation With Integrated Temperature Measurement Capability*, J. Lightwave Technol. 35 (2017) 3447–3454. https://doi.org/10.1109/JLT.2016.2618618

    An optical fiber applicator integrates laser delivery and temperature sensing for tumor ablation. Tests in tissue phantoms and ex vivo liver confirm precise, real-time thermal monitoring.

11. A. Candiani, M. Konstantaki, A. Pamvouxoglou, S. Pissadakis, *A Shear Sensing Pad, Based on Ferrofluidic Actuation in a Microstructured Optical Fiber*, IEEE J. Select. Topics Quantum Electron. 23 (2017) 210–216. https://doi.org/10.1109/JSTQE.2016.2607460

    A flexible optical fiber shear sensor using ferrofluid and magnets detects multidirectional shear displacements from 100 µm to 4.25 mm, operating under vertical pressures up to 11 kPa.

12. M. Barozzi, A. Manicardi, A. Vannucci, A. Candiani, M. Sozzi, M. Konstantaki, S. Pissadakis, R. Corradini, S. Selleri, A. Cucinotta, *Optical Fiber Sensors for Label-Free DNA Detection*, J. Lightwave Technol. 35 (2017) 3461–3472. https://doi.org/10.1109/JLT.2016.2607024

    Reviews advances in optical fiber biosensors for label-free DNA detection, emphasizing fiber design and signal transduction strategies that advance lab-on-fiber diagnostic platforms.